

**Before the  
Federal Communications Commission  
Washington, D.C. 20554**

In the Matter of	)	
	)	
Use of Spectrum Bands Above 24 GHz For	)	GN Docket No. 14-177
Mobile Radio Services	)	
	)	
Establishing a More Flexible Framework to	)	IB Docket No. 15-256
Facilitate Satellite Operations in the 27.5-	)	
28.35 GHz and 37.5-40 GHz Bands	)	
	)	
Petition for Rulemaking of the Fixed Wireless	)	RM-11664
Communications Coalition to Create Service	)	
Rules for the 42-43.5 GHz Band	)	
	)	
Amendment of Parts 1, 22, 24, 27, 74, 80, 90,	)	WT Docket No. 10-112
95, and 101 To Establish Uniform License	)	
Renewal, Discontinuance of Operation, and	)	
Geographic Partitioning and Spectrum	)	
Disaggregation Rules and Policies for Certain	)	
Wireless Radio Services	)	
	)	IB Docket No. 97-95
Allocation and Designation of Spectrum for	)	
Fixed-Satellite Services in the 37.5-38.5 GHz,	)	
40.5-41.5 GHz and 48.2-50.2 GHz Frequency	)	
Bands; Allocation of Spectrum to Upgrade	)	
Fixed and Mobile Allocations in the 40.5-42.5	)	
GHz Frequency Band; Allocation of Spectrum	)	
in the 46.9-47.0 GHz Frequency Band for	)	
Wireless Services; and Allocation of	)	
Spectrum in the 37.0-38.0 GHz and 40.0-40.5	)	
GHz for Government Operations	)	

**COMMENTS OF O3B LIMITED**

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## **EXECUTIVE SUMMARY**

Satellite operators are using the mmW bands around the world today to address the rapidly growing demand for high capacity fixed and mobile broadband service. Each year brings new, major investments by satellite operators, satellite and earth station equipment manufacturers and launch service providers in research and development, construction of facilities, launch of new satellites, and entry into new markets. Investment and innovation in the mmW bands are thriving in the satellite industry, and the mmW bands are the primary spectrum in which satellites can and will serve the fast growing demand for broadband services. The characteristics that make use of the mmW bands challenging for mobile services are not obstacles to their use for satellite service. Given the dearth of other bands available to meet growing demand for satellite services that support the broadband economy, satellite operators are relying on these bands to meet near term and long term requirements.

O3b has deployed an innovative global system that relies on 28 GHz Ka-band spectrum to provide high-throughput, low-latency links to wireless carriers, wireline broadband providers, enterprises, and governments around the world, in places where terrestrial links are impossible, impractical, too expensive, or too limited. In the early years of its operation, O3b is already a game-changer.

O3b's system was designed and built to use Ka-band frequencies, including the 27.6-28.4 GHz band. This portion of the Ka-band is allocated to FSS (earth-to-space) on a co-primary basis internationally, and is essential to operation of O3b's network throughout the world. O3b has to date been able to work within the constraints of the U.S. treatment of FSS as secondary to FS in this band. But O3b may have to eliminate or restrict service if it is required to operate secondary to terrestrial mobile services. If the FCC permits mobile service in the 27.5-28.35 GHz band ("the 28 GHz band"), it should do so in a way that does not negate or impair the enormous

investments satellite operators and their customers have made to expand broadband service. It must also provide a clear and assured path for future investment and growth in satellite services.

The NPRM's proposal to assign terrestrial mobile licenses by geographic area would impair existing satellite services and inhibit future growth, even while leaving the mmW bands unused in large areas. Geographic licensing is inappropriate for mmW bands that, in a mobile deployment, may cover the area of a city block (or two) even with a clear line of sight. The NPRM acknowledges the need for mmW policy to account for this property of the mmW bands. But the mechanisms the NPRM proposes to address the issue will not work.

If the FCC permits mobile service in the mmW bands, and in the 28 GHz band in particular, it should do so on a traditional site-licensed basis. The FCC should adopt a basic framework of operating parameters for mobile services so that FSS and mobile operators can make long term plans and investments based on a stable regulatory structure. Applications for new facilities (or clusters of facilities) should protect licensed facilities and conform to general operating parameters established by industry consensus and incorporated in the FCC's rules. Any mutual exclusivity should be resolved first through coordination and, failing coordination, through auction, as required by the FCC's auction authority.

Like mobile operators, satellite operators need substantial spectrum for exclusive use. Unlike mobile operators, satellite operators can and do use the mmW bands to provide ubiquitous service. But site licensing is a far better approach for the mmW bands that the FCC authorizes for shared use. It is a well-understood licensing framework that provides a stable regulatory environment, effectively precludes warehousing, and fosters innovation and investment.

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**COMMENTS OF O3B LIMITED**

O3b Limited (“O3b”) welcomes the opportunity to submit these comments in response to the Commission’s Notice of Proposed Rulemaking (“NPRM”) for the Use of Spectrum Bands Above 24 GHz For Mobile Radio Services and, *inter alia*, Establishing a More Flexible Framework to Facilitate Satellite Operations in the 27.5-28.35 GHz and 37.5-40 GHz Bands.

## I. INTRODUCTION

### A. O3b's System and Services

O3b is a global Ka-band broadband satellite system in medium Earth orbit (“MEO”) that operates a constellation of twelve non-geostationary (“NGSO”) satellites. O3b offers satellite capacity and low-latency, high-throughput connectivity – generally 10 to 100 times the throughput of a traditional satellite – to Internet service providers, telecom operators, large enterprises and governments, to enable fast, flexible and affordable broadband connectivity in locations unserved or underserved by other broadband services, such as fiber and mobile networks.<sup>1</sup> O3b uses spot beams to provide middle mile capacity that enables large service providers to provide high-data rate, low latency connectivity to their customers. The O3b satellite system uses the 27.6-28.4 GHz and 28.6-29.1 GHz bands for uplinks and 17.8-18.6 GHz and 18.8-19.3 GHz bands for downlinks.

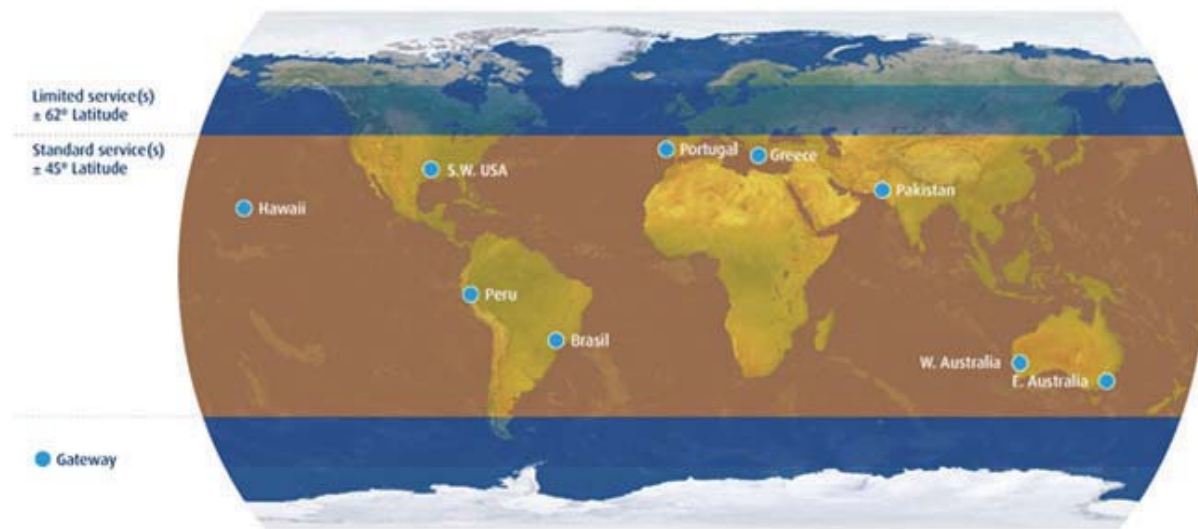


Figure 1 - O3b's Global Coverage Map

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<sup>1</sup> O3b's ubiquitous reach within its coverage area allows mobile operators to provide mobile voice and data service in places that are not served by fiber or other terrestrial backhaul networks.

After one year in service, O3b already needs substantially more capacity to accommodate the growing demand for its high throughput, high performance connectivity. In late 2015, O3b secured a further 460 million dollars in financing to support the company's extraordinary growth, which will be used to manufacture and launch eight more satellites.<sup>2</sup>

## **B. O3b's Role in the Telecommunications Infrastructure in the United States**

*U.S. Facilities and Investment.* O3b has made significant investments in the U.S. because O3b's access to the 28 GHz band allowed its U.S. installations to support its global infrastructure and services, including its customers in the United States. O3b has successfully coordinated with local LMDS operators, or deployed in regions where there are no LMDS operators, to enable the use of the 28 GHz band for O3b's domestic customers and operations. The predictability and stability of LMDS fixed-service deployment has allowed O3b to meet the growing data demands of its U.S. customers.

Under the existing regulatory framework, O3b has installed and operates essential components of its terrestrial infrastructure in the United States:

- O3b has located two of its nine gateways, as well as its new Network Operations Center, in the United States.<sup>3</sup> Each facility represents a multi-million dollar investment.
- O3b relies on these facilities, which use the 27.6-28.4 GHz band, to provide customers domestically and abroad with a fiber-like alternative in areas with limited or no access to high-speed, low-latency internet connectivity. Without

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<sup>2</sup> O3b Networks Announces the closing of \$460M in Financing to Expand its Constellation and Support Unprecedented Customer Growth, <http://www.o3bnetworks.com/o3b-networks-announces-closing-460m-financing-expand-constellation-support-unprecedented-customer-growth/> (last visited Jan. 28, 2016).

<sup>3</sup> O3b's U.S. gateway earth stations are located in Vernon, Texas and Sunset Beach, Hawaii. Key ground segment components are also located at its global Network Operations Center near Manassas, Virginia.

these facilities, the O3b constellation could not operate.

*U.S. Customer Base.* O3b is already the leading satellite provider of capacity in the Pacific, providing 6 Gbps of contracted capacity to Pacific Island nations.<sup>4</sup> O3b's ability to deliver large amounts of low-latency capacity to remote islands has been a tremendous accelerator of broadband access in this region.<sup>5</sup>

- O3b provides 1.2 Gbps of capacity to American Samoa Telecommunications Authority ("ASTCA"), more than doubling American Samoa's backhaul and internet capacity.<sup>6</sup>
- O3b offers fiber-like redundancy for territories like American Samoa in the event of any future submarine cable outages while also providing valuable capacity and backhaul services – as well as much needed competition in these hard-to-serve markets – when the undersea cables are fully operational.<sup>7</sup>

O3b's ability to provide large data capacity and enable real time applications even where fiber access is limited or non-existent drives demand from both the civilian and military arms of

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<sup>4</sup> Total capacity contracted in the Pacific now 6 Gbps, <http://www.o3bnetworks.com/6gbps-contracted-capacity-pacific/> (last visited Jan. 28, 2016).

<sup>5</sup> See *UNITECH enhances their educational opportunities with O3b internet*, <https://www.youtube.com/watch?v=dMirp8eimc8> (last visited Jan. 28, 2016); See also *Telecom Cook Islands-O3b*, <http://www.telecom.co.ck/content/page/o3b/m/4/> (last visited Jan. 28, 2016); See also *Norfolk Telecom goes live on O3b satellite network*, <https://www.o3bnetworks.com/norfolk-telecom-goes-live-on-o3b-satellite-network/> (last visited Jan. 28, 2016).

<sup>6</sup> Caleb Henry, *O3b Sees Contract Surge, Targets New Markets*, *Satellite Today* (June 19, 2015), available at <http://www.satellitetoday.com/telecom/2015/06/19/o3b-sees-contract-surge-targets-new-markets/> (last visited Jan. 28, 2016).

<sup>7</sup> Chairman Wheeler noted in his blog last year that U.S. Pacific and island territories can be susceptible to submarine cable outages that can effectively leave entire populations of U.S. citizens in a "communications blackout." Tom Wheeler, *Ensuring the Resiliency of Our Communications Infrastructure* (Aug. 27, 2015), available at <https://www.fcc.gov/news-events/blog/2015/08/27/ensuring-resiliency-our-communications-infrastructure> (last visited Jan. 28, 2016). O3b's unique ability to provide low-latency, high-capacity services to isolated regions of the U.S., even when there are cable outages, is critically important to the local populations.

the U.S. government.<sup>8</sup>

- The National Oceanic and Atmospheric Agency (“NOAA”), through SES Government Services, relies on O3b capacity to support the National Weather Service Office in Pago Pago, American Samoa.<sup>9</sup> Access to O3b capacity helps NOAA update forecast models and issue safety warnings in near real-time.
- As part of a U.S. Navy Limited Objective Experiment designed to identify new and innovative technologies, O3b delivered 600 Mbps of capacity to the U.S.S. Fort Worth while it was at sea.<sup>10</sup>

O3b’s ability to provide a fiber-like connectivity where there is no or limited terrestrial infrastructure has also made it an ideal solution for maritime and transportable applications, as well as for energy installations as the industry’s need for data grows.<sup>11</sup>

- O3b’s first customer in the U.S., Royal Caribbean Cruise Lines, uses O3b to provide high-speed internet connectivity to passengers and crews on board its ships while at sea and in port. Each of Royal Caribbean’s O3b-provisioned ships

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<sup>8</sup> O3b projects rapid growth in demand for its services. FirstNet recently rolled out its first Request for Proposals. See FirstNet Nationwide Public Safety Broadband Network, Solicitation No. D15PS00295E, available at <https://www.fbo.gov/index?s=opportunity&mode=form&tab=core&id=7806696f4340f16474647ccc57805040&ev=0> (last visited Jan. 28, 2016). FirstNet has already considered that satellite will play a critical role in deploying a nationwide first responder network. See Caleb Henry, *FirstNet Encourages Satellite Companies to Help Build US Public Safety Network*, Satellite Today (Oct. 19, 2015), available at [http://www.satellitetoday.com/regional/2015/10/19/firstnet-encourages-satellite-companies-to-help-build-us-public-safety-network/?hq\\_e=el&hq\\_m=3167972&hq\\_l=1&hq\\_v=d2dce4ea01](http://www.satellitetoday.com/regional/2015/10/19/firstnet-encourages-satellite-companies-to-help-build-us-public-safety-network/?hq_e=el&hq_m=3167972&hq_l=1&hq_v=d2dce4ea01) (last visited Jan. 28, 2016).

<sup>9</sup> Veronica Magan, *SES GS, NOAA Sign Agreement for O3b High Throughput Solution*, Satellite Today (Aug. 18, 2015), available at <http://www.satellitetoday.com/telecom/2015/08/18/ses-gs-noaa-sign-agreement-for-o3b-high-throughput-solution/> (last visited Jan. 28, 2016).

<sup>10</sup> O3b Networks Successfully Participates in U.S. 7th Fleet Trident Warrior 2015 Exercises, <http://www.o3bnetworks.com/o3b-networks-successfully-participates-in-u-s-7th-fleet-trident-warrior-2015-exercises/> (last visited Jan. 28, 2016).

<sup>11</sup> Global Big Data Market to Double its Growth Rate by 2018, <http://www.oilandgasbigdata.com/news/global-big-data-market-to-double-its-growth-rate-by-2018> (last visited Jan. 28, 2016).

has more bandwidth than the rest of the cruise industry combined.<sup>12</sup>

- With AvL, O3b has developed an 85 cm mobile terrestrial terminal that can be set up in 90 minutes.<sup>13</sup> This terminal is roughly one quarter the size of a traditional C-band terminal yet it delivers 10 to 100 times the throughput, enabling video streaming and cloud-based applications that the U.S. military can receive in no other way in remote un-fibered locations. O3b is working with another American manufacturer to develop an aeronautical terminal.
- O3b is providing capacity to Rignet to provide connectivity to offshore energy operations on a U.S.-flagged platform in the Gulf of Mexico,<sup>14</sup> which will enable significant improvements in productivity, operating efficiencies and safety for Rignet's customer.

As the Commission looks to pave the way for new technologies to meet the growing demand for data, it should recognize that the full potential of a broadband economy cannot be reached simply by adding more capacity to mobile networks. To foster a robust broadband economy, enhance competition, and assure global leadership in broadband, the U.S. must foster technologies that extend broadband to, and enhance broadband in, unserved and underserved places. In its first year of operation, O3b has already connected people, enterprises, and the U.S. military in the U.S. and U.S. territories, and could provide more capacity to more customers if not limited by the secondary treatment of FSS in the 27.5-28.35 GHz band. O3b's success to date

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<sup>12</sup> O3b Connects Royal Caribbean "Smart Ship" Anthem of the Seas in the Mediterranean, <http://www.o3bnetworks.com/o3b-connects-royal-caribbean-smart-ship-anthem-of-the-seas-in-the-mediterranean/> (last visited Jan. 28, 2016).

<sup>13</sup> O3b Announces the 85cm AvL Antenna, Brings Connectivity in 90 Minutes, <http://www.o3bnetworks.com/o3b-announces-the-avl-antenna-brings-connectivity-in-90-minutes/> (last visited Jan. 28, 2016).

<sup>14</sup> Rignet and O3b Networks Close Offshore Deal to Bring Low Latency Connectivity to the Gulf of Mexico, <http://www.o3bnetworks.com/rignet-o3b-networks-close-offshore-deal-bring-low-latency-connectivity-gulf-mexico/> (last visited Jan. 28, 2016).

is a demonstration of the need for low-latency, high throughput satellite capacity in the U.S., its coastal waters, and its territories.

The Commission should craft rules that allow O3b and other satellite operators to help meet the demand for data now, in the years leading up to 2020 and well into the future. At a minimum, the new rules resulting from this NPRM should provide for co-primary FSS operations in mmW bands allocated to FSS, recognizing existing investment and deployment in FSS as well as future requirements for expansion. As noted above and explained in these comments, O3b believes authorizing co-primary mobile services based on exclusive geographic license areas is an inefficient approach for mmW band licensing and would harm the public interest.

## **II. DISCUSSION**

### **A. Rules for Use of mmW Bands in Terrestrial Mobile Networks Should Reflect and Adapt to Differences from Previous Wireless Deployments**

Comments filed in response to the NOI reflect great uncertainty regarding the scope of mobile use of the bands above 24 GHz. As the NPRM acknowledges, the mmW bands may always present substantial challenges to the provision of mobile service”<sup>15</sup> and that “even among telecommunications equipment manufacturers, there is not an overwhelming consensus on the record that terrestrial mobile services will rapidly proliferate in the mmW bands in the near future.”<sup>16</sup> The record in these dockets and the NPRM itself reflect characteristics of the bands – propagation, power requirements and RF exposure – that present significant challenges for

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<sup>15</sup> See NPRM ¶ 23 (*citing* Ericsson NOI Comments at 6 (“Propagation limitations will greatly limit non-line of sight coverage, especially in rural and suburban areas where line of sight is not augmented by reflective paths.”); Alcatel-Lucent NOI Comments at 10 (“Coupled with blocking effects, one can expect the connectivity to be rather intermittent with frequent searches for new beam directions required to maintain the link”); Huawei NOI Comments at 7 (“For mobile services, limits of propagation and obstruction at these millimeter wave frequencies will diminish practicality of millimeter wave systems to low-level small cells”)).

<sup>16</sup> *Id.*

deployment of terrestrial mobile services.<sup>17</sup> Although they may conceivably and eventually provide additional capacity as adjuncts to existing wireless networks, the mmW bands are not expected to be capable of providing stand-alone mobile service.<sup>18</sup> It is unlikely that mobile services in these bands will ever be deployed in the vast majority of the United States, measured by geography, even if mobile licensees are given unrestricted access.

These characteristics of the mmW bands – all of which emerge from basic physics – belie an urgency to adopt service rules today to match the “rapid pace of technological development in these bands”.<sup>19</sup> In fact, based on where technology stands today, the possibility of terrestrial mobile service in this band is still years in the future. Rulemaking proceedings can be completed in less than a year, and undertaking a rulemaking when more is known about the use cases and timeframe for mobile mmW deployment would foster better informed rules, likely in a shorter timeframe. Waivers and experimental licenses can be granted much more quickly still. Far from enabling innovation, adopting a “mobile first” regulatory structure before the practical capabilities of the bands for mobile services are known (and when what is known counsels that terrestrial deployment will be very limited) would instead draw boundaries around innovation. This approach would discourage investment in development of technology in existing services in the band, like FSS, that are disfavored by regulation.

Many of the most difficult questions raised by the NPRM – about appropriate performance requirements, for example – arise from the FCC’s effort to hammer the square peg

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<sup>17</sup> See, e.g. Notice of Ex Parte of Public Knowledge, GN Docket No. 14-177 at 3 (filed Jan. 8, 2016) (“Given the radically different propagation characteristics of the spectrum, traditional cellular architectures cannot meaningfully be deployed without using power levels that create public health risks. The failure of existing licensed services in the bands to effectively utilize their existing geographic licenses underscores the spectrum inefficiency and technical difficulties in deploying geographic area licensing.”). See also fn. 15, *supra*.

<sup>18</sup> For this reason, terrestrial mobile services are unlikely to introduce new competition. Satellite operators are already using the 28 GHz band to provide competition – both to terrestrial broadband services and with other satellite services – and to bring advanced services to remote areas.

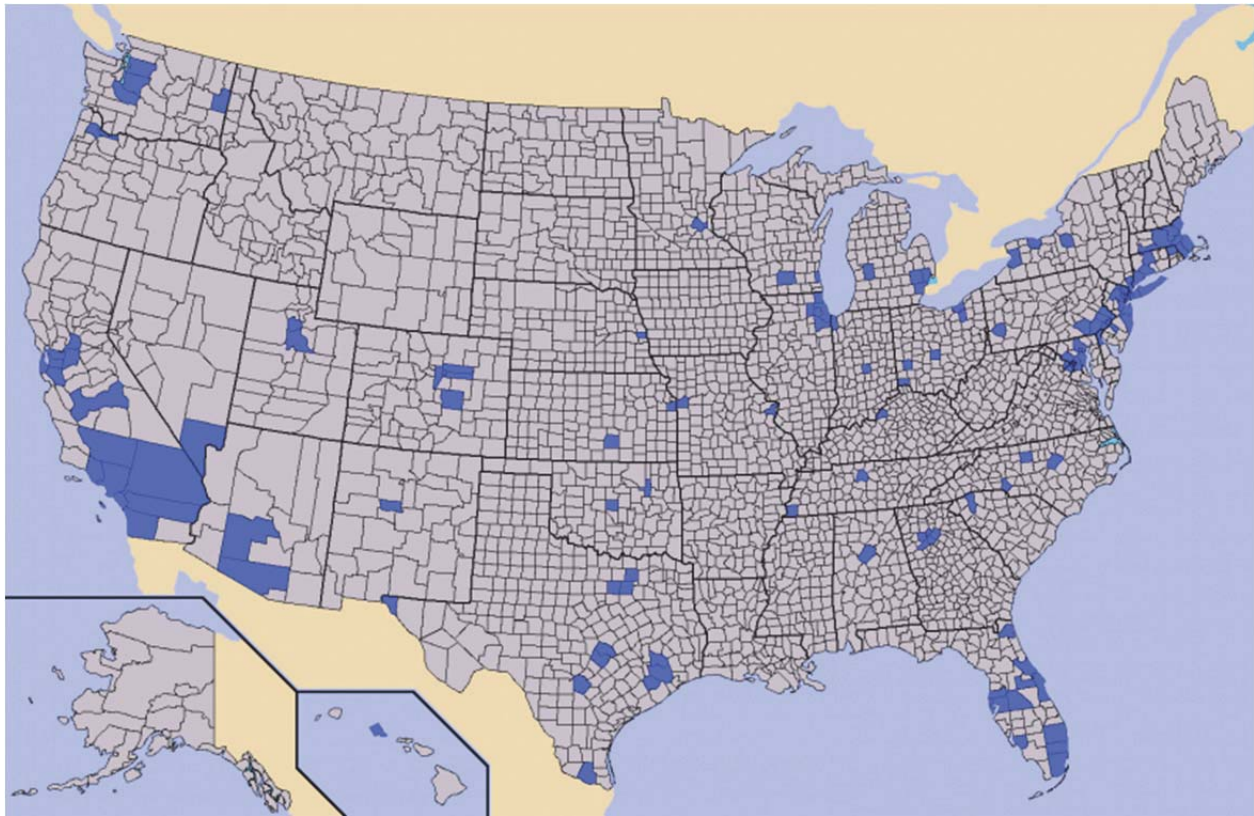
<sup>19</sup> See NPRM at ¶ 24.

of terrestrial mmW service into the round hole of a “mobile” regulatory construct. The NPRM and NOI Comments confirm that any deployment of mmW bands terrestrially is likely to be highly “localized” – a combination of small “mobile” cells and discrete point-to-point links providing backhaul and extra capacity to heterogeneous networks. These are not “mobile” services in the sense in which the existing mobile regulatory structure evolved. That construct proceeds from the assumption that “mobile” services need unlimited headroom to expand because deployment may be ubiquitous. The plausibility of ubiquitous terrestrial service, at least in populated areas, justifies preclusion of other services that might also use the legacy mobile bands productively. But that is decidedly not the case in the mmW bands.

The challenge of identifying performance requirements that strike the right balance of incentivizing coverage while permitting licensee flexibility arises from the fact that geographic licensing, even at the relatively small county level, is not appropriate to the terrestrial propagation characteristics of mmW bands. This problem is compounded by the high degree of clustering of the U.S. population. Half of the U.S. population lives in just 146 – under 5% – of the country’s counties.<sup>20</sup> The other half is spread across the remaining 2,997 counties. In those counties, shown in gray in Figure 2 below, deployment of a few terrestrial links in a very small area might cover a substantial portion of the population and thus meet a performance benchmark. Having perfected rights to an entire county through a limited deployment, that licensee would have the ability to exclude other uses in the remainder of the county in perpetuity.

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<sup>20</sup> Walter Hickey and Joe Weisenthal, *Half of The United States Lives in These Counties*, Business Insider (Sept. 4, 2013), available at <http://www.businessinsider.com/half-of-the-united-states-lives-in-these-counties-2013-9> (last visited Jan. 28, 2016).



**Figure 2- More than Half of Americans Live in 146 Counties**

A geographic area licensing model developed for mobile service that assumes ubiquitous deployment by a single operator using base stations that cover large areas (indoors and out) is not an appropriate model for bands that provide mobile service radii of a few hundred meters (at most) outdoors and are blocked by walls, buildings and terrain.

**B. The mmW Bands are Core Bands in Satellite Networks, are Widely Used Today, and are Essential to the Growth of Satellite Broadband Services**

While the nature of deployment of future mobile mmW services will be limited geographically and is still being studied, satellite use of the 28 GHz band is already both prolific and global. Satellite systems operating in the 28 GHz band provide “last mile” links, “middle mile” connectivity and critical backhaul capacity for both fixed and mobile broadband service to businesses, private and public enterprises, and other customers across the continental U.S. and in U.S. territories and possessions, at sea and around the world. The factors that limit the utility of

the mmW bands for terrestrial mobile services do not limit the utility of the bands to provide satellite-based connectivity. Satellite-earth stations and satellites operate in mmW bands with very directive, high power links that propagate well, are generally aimed upwards so that terrestrial obstructions are less of a factor, have ready, sustained sources of power, and are sited to prevent harmful RF exposure. They are also capable of providing service ubiquitously to fixed locations and of supporting ubiquitous mobile service in certain special use cases (e.g., maritime and aeronautical). Indeed, true ubiquity has been the hallmark of space-based commercial communications from the beginning.

The contrast we draw between the respective roles of the mmW bands in terrestrial mobile networks, on the one hand, and satellite networks on the other is not to argue that one service is better, more important, or should represent a higher policy priority than the other. Rather, it is to emphasize that regulatory policy does not require the FCC to – and the FCC should not – constrain the market by deciding which technology is more important. The NPRM acknowledges that mmW use should be compatible with existing incumbent users<sup>21</sup> and that “it is important to establish a flexible regulatory framework that accommodates as wide a variety of services as possible because there is much that is unknown about all future uses of the mmW bands.”<sup>22</sup> As discussed below, a well-considered, technology neutral, market-based licensing structure can allow fixed, mobile and fixed-satellite services to proliferate while enabling the highest and best uses of the mmW frequencies in each geographic area in shared-use bands.<sup>23</sup>

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<sup>21</sup> See NPRM ¶ 22.

<sup>22</sup> See NPRM ¶ 23. Of course, much *is* known about the future use and utility of the mmW bands, because they are ideal for high capacity satellite links. Downplaying and curtailing the cutting-edge technology already deployed and constantly being upgraded by satellite operators, while giving priority to possible new services that may or may not materialize at some time in the future, would be antithetical to the public interest.

<sup>23</sup> Sharing is not appropriate in all of the mmW bands, and the sharing approach proposed in these comments may not be the best approach for other mmW bands. As these comments explain, FSS operators require substantial amounts of spectrum in which ubiquitous service can be deployed, just as mobile operators enjoy exclusive

**C. Primary Mobile Services in the 28 GHz Band Are Inconsistent with the NPRM's 5G Band Selection Criteria**

The four terrestrial mobile mmW band selection criteria identified in the NPRM also suggest that the FCC should proceed cautiously, particularly in the 28 GHz band. First, several commenters state that the FCC should focus on bands with at least 1 GHz of contiguous spectrum,<sup>24</sup> which is not available in the 28 GHz band.<sup>25</sup> Second, the NPRM recognizes the importance of international harmonization in choosing bands for terrestrial mobile use. WRC-15 opted not to study the 28 GHz band for IMT, reflecting broad regional opposition and that the band is already in widespread use for satellite services.

Third, the NPRM also acknowledges that terrestrial mobile use in mmW bands should be compatible with existing incumbent license assignments and uses.<sup>26</sup> Because terrestrial mmW service will not be ubiquitous (in the sense that terrestrial RF mmW signals will not be available at most points in any appreciably large geographic area), granting co-primary mobile rights over large geographic areas is unnecessary to facilitate mobile service, but would give those licensees the power to displace incumbent FSS users or preclude future FSS use without any corresponding benefit for the public.

Fourth, the NPRM notes that the regulatory framework should be flexible and should accommodate as wide a variety of services as possible, but then proposes rules that favor exclusive licensing of mobile services over large geographic areas and that would preclude

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geographic licenses in their core bands. The technical characteristics of mmW bands make them exceptionally well suited to the provision of satellite broadband services, including trunking and backhaul of terrestrial broadband to make that service more ubiquitous.

<sup>24</sup> See NPRM ¶ 16.

<sup>25</sup> Satellite, too, needs access to more than 500 MHz to operate efficiently and deliver the levels of high bandwidth service that are demanded today. That is why O3b already uses the 27.6-28.4 globally for gateways and outside the U.S. for customer terminals.

<sup>26</sup> See NPRM ¶ 22.

effective use by other services, including satellite services. That bias does not promote flexibility or a wide variety of services. And it is especially inappropriate given that it would thwart investment in FSS, which has already demonstrated highly efficient and productive use of the 28 GHz band.

O3b is particularly concerned about the proposal to authorize primary mobile service in the 27.5-28.35 GHz band. O3b designed and built its system to operate pursuant to the global primary allocation of the 27.6-28.4 GHz band for FSS. Assured use of this band in the U.S. and globally for earth-to-space uplinks is essential to the operation of O3b's global system. Although the U.S. treatment of FSS as secondary to FS in the 27.5-28.35 band has caused challenges O3b has not faced elsewhere, that secondary-to-FS status was considered in O3b's design, and to date O3b has been able to coordinate and operate in the U.S. O3b's design does not assume that O3b will be secondary to mobile operations in United States in the 27.5-28.35 GHz band. In the presence of primary mobile operations, FSS must also be co-primary at a minimum.

Allowing mobile services in the 28 GHz band in the U.S. on a primary basis raises three major issues for current and future operation of O3b's constellation. First, existing earth stations must not be required to protect future mobile services in the United States because they were not authorized when O3b was designed and built. Second, O3b must be able to deploy additional earth stations using 27.6-28.4 GHz uplinks in the U.S. and internationally to support growing capacity, and be certain that those earth stations may continue operating once built. Finally and equally if not more important, any future mobile use in the United States must be deployed in a way that does not cause aggregate harmful interference to O3b's satellite receive antennas. Relying on a previously stable regulatory regime in the United States and globally, O3b and

other FSS service providers<sup>27</sup> have made very large investments in satellite networks (a global Ka-band system, in O3b's case) that cannot be re-designed now.

Given the widespread deployment of satellite services in the Ka-band today (and the lack of mobile deployment in the Ka-band), and consistent with the NPRM's assessment that mobile use of mmW bands should be adopted where the most spectrum is available, the FCC should focus on the bands above 28 GHz, where more spectrum is available and no other services are widely deployed. Terrestrial deployment of mobile services in the 28 GHz band, if authorized, should proceed in a manner that does not restrict operation of O3b's existing site-licensed earth stations, does not unduly restrict deployment of additional site-licensed earth stations in the U.S., and does not cause harmful interference at satellite receive antennas. With careful planning, thoughtful policy, and industry cooperation, it may be possible to do so.

The NPRM acknowledges that FSS operators need a path to protected/primary status for future earth stations, proposes several alternatives, and seeks comment on other options for primary status that are consistent with mobile deployment.<sup>28</sup> In Section F below, O3b proposes an alternative approach that is market-driven, will permit mobile services to enter (and FS and FSS services to continue to expand in) the 27.5-28.35 band, and will not unduly jeopardize the substantial investments FSS operators have made to date.

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<sup>27</sup> Viasat-1, which cost approximately \$500 million to put into service, utilizes 28 GHz band for gateway-type uplink operations. *See* Exhibit A II.B.2.ii, Call Sign 2902, SAT-LOI-20130319-00040; *See also*, Steve Schuster, *Boeing "Surprise" Winner of ViaSat-2 Deal*, *Satellite Today* (May 17, 2013), available at <http://www.satellitetoday.com/telecom/2013/05/17/boeing-surprise-winner-of-viasat-2-deal/> (last visited Jan. 28, 2016). O3b, which relies on the 28 GHz band for gateway and commercial use, raised \$1.2 billion for initial investment and recently raised another \$460 million for the next 8 satellites. *See* O3b Networks raises total funding of US\$1.2 billion, <http://www.o3bnetworks.com/o3b-networks-raises-total-funding-us1-2-billion/> (last visited Jan. 28, 2016); *see also* O3b Networks Announces the closing of \$460M in Financing to Expand its Constellation and Support Unprecedented Customer Growth, *supra*, note 2. Hughes also relies on gateway access to the 28GHz band for gateway operations for its Jupiter-1 space station. *See* Narrative I.C., Call Sign S2834, SAT-MOD-20141210-00127.

<sup>28</sup> *See* NPRM ¶ 138.

**D. Global Harmonization and Global Scale are Critical for Satellite and Terrestrial Services**

The Commission's NPRM repeatedly stresses the importance of U.S. leadership in mobile communications.<sup>29</sup> However, any U.S. regulatory framework will not operate in isolation from the regulatory blueprint adopted by other nations. If the Commission overly favors the rights of mobile services at the expense of other services in the 28 GHz band, it can limit the ability of other countries to adopt compatible regulatory frameworks. The just-concluded WRC did not identify the 28 GHz band for study for mobile services because of other significant national and private interests and investments in Ka-band satellite operations already in place in the 28 GHz band. If the U.S. truly hopes to lead in 5G, particularly in the 28 GHz band, it must develop a licensing scheme that preserves the ability of existing services, including FSS, to have practical commercial access to the band.

The U.S. regulatory approach to deployment of mobile services in the mmW bands generally, and in the 28 GHz band in particular, must be consistent with the ongoing deployment of satellite services in the bands. The impact on FSS service of a divergent approach in the U.S. could be devastating, disrupting long-standing business plans and tilting the playing field away from critical FSS growth and innovation. The higher cost of manufacturing different equipment for different countries would deter the development and deployment of new terrestrial mobile services in the U.S. and around the world.

Satellite services and satellite networks form an intricate global market that is integral to the expansion of broadband services throughout the world. Particularly in the 28 GHz band, where satellite operators like O3b have already invested billions in global systems that cannot be

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<sup>29</sup> See NPRM ¶ 24; Statement of the Chairman; Statement of Commissioner Rosenworcel; and Statement of Commissioner Pai.

re-designed, a decision of the U.S. to chart a different course would not only limit or preclude service in the U.S. It could compromise service and investment globally. By developing a system that allows both FSS and terrestrial services to deploy as needed, the U.S. can maximize its influence over the global deployment of mobile services in the mmW bands.

**E. If the FCC Authorizes Primary Mobile Services in the mmW Bands It Should Pursue a Technology-Neutral Licensing Mechanism**

**1. The mmW Bands Proposed for Mobile Should Accommodate Shared/Flexible Use**

The FCC's treatment of FSS as secondary to FS in the 28 GHz band has not been ideal for satellite operations, but it has enabled deployment of site-licensed FSS earth stations to support billions in investment in multiple innovative international satellite systems. FSS has not constrained FS deployment, and FSS operators have worked around the primary FS allocation through coordination. Naturally, O3b would prefer that the FCC not authorize mobile service in the 28 GHz band. But if co-primary mobile is to be authorized, it must be done in a way that is consistent with the ongoing and growing use of the band for FSS uplinks.

The characteristics of the mmW bands are such that mixed FSS/mobile use, while not ideal for FSS, is feasible in some limited bands so long as both mobile and FSS operators each have access to sufficient other spectrum in which they can provide ubiquitous service. But auction of geographic blocks based on a primary mobile status is not a path to a robust, efficient, productive mixed use environment in the mmW bands. Authorizing the bands for exclusive primary mobile/FS use would leave large areas unserved by mobile and yet severely curtail the highly productive use of these bands by satellite operators. The NPRM acknowledges this issue,<sup>30</sup> to a degree, and proposes two different approaches to mitigate this fundamental problem

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<sup>30</sup> See NPRM ¶ 45 ("It appears that terrestrial mobile use of the mmW bands may initially be concentrated in large urban areas. Foreclosing use of the 39 GHz band for satellite could result in underutilization of the band.").

with geographic licenses. First, the FCC proposes to permit satellite operators to compete at auction for terrestrial rights, which would confer the right to exclude terrestrial use.<sup>31</sup> Second, the NPRM proposes to permit satellite operators to obtain rights from the terrestrial licensees through coordination or on the secondary market.<sup>32</sup> As explained below, neither of these solutions would ensure practical commercial access for FSS.

## **2. The Traditional Auction Model – Terrestrial Operators Bidding for Exclusive Rights to Defined Geographic Areas – is Inapposite for mmW Bands**

It is not practical for FSS operators to gain access to the 28 GHz band by acquiring geographic area licenses in competition with mobile service providers as a prerequisite to building site-licensed earth station facilities. Mobile mmW sites – which will not actually be “mobile” so much as sites that might provide service to devices that are mobile in much the way 2.4 GHz band hotspots do today – will be microcells. Each of these can easily be confined to discrete, pre-defined geographic areas that will fit easily within geographic license areas of almost any granularity. And as both FS and mobile mmW services are most likely to be adjuncts to much larger heterogeneous networks, it is likely that the mobile rights (at least) will be acquired by providers serving very large geographic areas, such that the same licensee may control many adjacent geographic licenses. Geographic licenses therefore “work” for mobile operators in spite of the fact that the mobile operator will not actually need to deploy in most of the area of the license.

In contrast, requirements for site-licensed satellite earth stations are much less uniform. In most cases the interference footprint will be small, but that can vary depending on the type of satellite system, the type of earth station, surrounding terrain, typical rain cell density, and many

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<sup>31</sup> See NPRM ¶ 132.

<sup>32</sup> See NPRM ¶ 135.

other factors. Pre-defined geographic areas of any size are unworkable for FSS, particularly if the only assured path to access is to acquire those licenses via auction. If the geographic licenses are too small, an FSS operator may need to acquire several licenses (or, in the secondary market, negotiate with several incumbents), and failure to acquire all (or coordinate with all) would preclude the deployment. If the license areas are too large, the FSS operator would be required to bid for vastly more spectrum rights than it actually needs.

For this reason alone, an mmW auction model in which FSS operators compete with mobile operators for geographic blocks would always strongly favor the mobile bidders. This does not imply that mobile is a higher and better use. Congress recognized this intrinsic difference between satellite and terrestrial systems and adopted the ORBIT Act<sup>33</sup> to prevent the problem of unequal auction footing, and the threat of sequential auctions in jurisdictions around the world, from hindering satellite deployment. The FCC must proceed with extreme care here, because export of a policy that hampers growth of satellite services in the U.S. would cause exponentially more harm globally.

### **3. FSS Access Through the Secondary Market or Coordination is Not Workable**

Acknowledging that holders of terrestrial flexible use licenses for large geographic areas are unlikely to deploy service to cover much of the geographic area, the NPRM posits that FSS operators should be able to coordinate with those terrestrial licensees, or acquire needed rights in the secondary market.<sup>34</sup> This is not a workable solution for FSS operators. A terrestrial mobile licensee that has perfected rights to exclude others from a large geographic area based on buildout in a small portion of that area will have little incentive to give up future optionality, and

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<sup>33</sup> See 47 U.S.C. § 765f.

<sup>34</sup> See NPRM ¶¶ 132-135.

if it does, it may be willing to do so only on a conditional basis and at a price that is prohibitive.<sup>35</sup>

In some cases, FSS operators have limited flexibility in siting earth stations and could be subjected to extortionate demands. And should a small number of terrestrial licensees acquire a large number of mobile licenses covering significant portions of the U.S., they would enjoy extraordinary pricing power, even if FSS operators did have flexibility as to location. While coordination may work in some cases, it cannot be the sole option, because FSS operators must be able to add earth stations as a matter of course in order to continue to expand service.<sup>36</sup>

FSS has been able to coexist with FS in the 28 GHz band because FSS earth stations have been sited so as not to cause interference with existing FS links. The use cases and deployment scenarios of LMDS links are well known. But as the NOI comments and the NPRM reflect, what “5G” mobile services will look like is speculative at this point, and any actual deployment is years in the future. A winning bidder for FS/mobile rights – or an FS incumbent awarded a windfall mobile upgrade – would likely want to keep all options open, in spite of the likelihood that neither FS nor mobile links will ever be deployed in most geographic areas. This means that by awarding mmW licenses based on geographic areas the FCC would, in effect, be selling the right to use spectrum in a small area bundled with the right and incentive to exclude use in a much larger area. That approach would not foster efficient use of spectrum resources. The NPRM’s assumption that FSS operators can negotiate for access amounts to a hope that the market will find a workaround to a flawed spectrum licensing model.

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<sup>35</sup> Since FSS operators provide mobile traffic backhaul for remote and rural carriers in other countries and are capable of doing so in the United States, terrestrial operators may also be reluctant to enable potential competitors for their own backhaul services.

<sup>36</sup> Timing is critically important in deploying earth stations. Efficient and productive use of billions of dollars of satellite capacity in space depends on timely deployment of supporting earth stations. Merely by delaying negotiations, whether to extort higher payments or simply because coordinating is not a priority, a mobile licensee could strand enormous investments and impair service in the U.S. and around the world.

**4. Neither Auctions Nor Coordination Will Adequately Address the Problem of Aggregate Interference from Mobile Service at the Satellite Receive Antenna**

Even if a combination of auctions, coordination, and secondary markets could provide adequate assurance of access to sites and spectrum for satellite uplinks (existing and future), those tools cannot solve the other problem created by issuing co-primary mobile licenses in the 28 GHz band. At some level of deployment, the aggregate effect of mobile links radiating (or spilling) skyward has the potential to overwhelm an FSS link by causing interference at the satellite receive antenna. As the aggregate uplink interference implicates all terrestrial operations in the aggregate, no operator-to-operator coordination will resolve the problem. It can only be addressed through rules that ensure aggregate mobile deployment within a satellite beam will remain below a certain threshold.

If mobile services are permitted in the 28 GHz band they should be introduced in a way that is compatible with ongoing deployment of 28 GHz satellite uplinks and interference-free operation of Ka band satellites. Given the propagation characteristics of the band and the fact that FSS base stations can often be sited in suburban or rural areas, while mmW mobile deployments are most likely in dense urban environments, a workable mixed use mobile/FSS service environment may be possible. That assumes, however, that the FCC adopts a truly technology neutral licensing regime that allows FSS operators to have reliable access to the band, limits aggregate interference from mobile operators towards Ka band satellites, and maintains sufficient spectrum for exclusive and ubiquitous use by satellite operators.

**F. A Cutoff or Filing Window Approach with Technical and Operating Rules for FS, Mobile and FSS Will Facilitate the Highest and Best Uses of the mmW Bands**

Should the FCC authorize co-primary mobile services in the mmW bands examined in this NPRM, and in the 27.5-28.35 GHz band in particular, it must do so with a flexible licensing

regime that accommodates existing and future FSS earth station deployment, and protects existing and future space assets that rely on this band globally. For the reasons discussed above, auctioning predefined geographic licenses will not serve the public interest. Instead, if the FCC permits mobile service in the 28 GHz band, it should assign licenses to specific facilities or clusters of facilities. The FCC should adopt basic operating parameters for each type of facility (or facility cluster)<sup>37</sup>, based on consensus of or input from stakeholders. A prospective operator could file an application that conforms to the facility and service rules at any time. The FCC would place each application for new or modified facilities (or clusters of facilities) on public notice and establish a cutoff window.

At that time, any party wishing to deploy mutually exclusive facilities in any permitted service could file a competing application within the cutoff window, and any existing licensee that believed the proposed facilities would cause interference to its licensed, protected facilities could submit a petition to deny.<sup>38</sup> In either case, applicants for mutually exclusive facilities would be given the opportunity to resolve the mutual exclusivity through coordination, which, if successful, would permit the FCC to grant construction permits to the applicants. If the parties to a mutually exclusive pool could not resolve the exclusivity by coordination, the FCC would conduct an auction between or among the mutually exclusive applicants. This procedure would apply equally to applications for new facilities as well as to applications for major modifications to existing facilities. The FCC's auction authority provides for this process<sup>39</sup> and the FCC

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<sup>37</sup> A facility cluster could be, for example, as a mobile network with in-band backhaul to serve an applicant-defined geographic area, or a cluster of satellite earth stations in a defined area.

<sup>38</sup> As an alternative approach, the FCC could periodically open filing windows and assign any groups of mutually exclusive applications into processing groups, just as it has traditionally done in other services. If a filing window approach is adopted, filing windows would need to be opened frequently to give satellite and terrestrial network operators the opportunity to seek new facilities in the ordinary course. *See Competitive Bidding for Commercial Broadcast and Instructional Television Fixed Service Licenses*, First Report and Order, 13 FCC Rcd 15920 (1998).

<sup>39</sup> *See* 47 U.S.C. §§ 309(j)(1), (j)(6)(E).

routinely uses this approach to issue site-based licenses.

Site-based construction permits would be valid for an appropriate period to permit construction. Once constructed, the facilities would be fully protected against new users. Permits would expire if conforming facilities were not built within the construction period. To discourage speculation and warehousing, rules would generally prohibit the transfer of bare licenses. Since no licensed areas without operating facilities would exist, there would be no secondary markets.

O3b does not expect that a cutoff/site licensed approach would lead to a proliferation of FSS earth station applications. From O3b's perspective, the point of site licensing is simply to provide a high level of assurance of access for the relatively small number of coordinated sites FSS operators may need to support system and service growth. There is no risk that site licensing of earth stations will noticeably constrain deployment of compatible mobile services in the same bands.<sup>40</sup> Earth station applications would comply with applicable service rules, subject to petitions to deny and to competing applications filed by terrestrial operators and even other satellite operators.

In contrast to the experimental regulatory approach proposed in the NPRM, a cutoff approach has been used in other services for decades. It is well understood by FCC licensees and staff and has been honed by years of precedent. Site/cluster based cutoff processing obviates many of the most complex questions in the NPRM regarding appropriate rules for cross-border and inter-service interference, anti-warehousing, and applying geographic performance requirements for a small-cell service to large area licenses. It precludes large scale warehousing, leaving the band open to innovation, because only the spectrum actually used is reserved. It eliminates the difficulty of creating and enforcing performance requirements addressing

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<sup>40</sup> O3b supports Viasat's proposal for opportunistic use of any shared mmW bands by satellite earth stations on an unprotected basis.

deployment of small cells in large geographic areas and which must account for mixed uses.<sup>41</sup>

Site based licensing with cutoff processing is also consistent with the NPRM's recognition that mixed uses are possible given the propagation characteristics of the mmW bands. It creates strong incentives for parties to coordinate to facilitate intensive and flexible use, rather than to preclude use.

If the FCC proceeds to authorize mobile services in the mmW bands it can and should adopt a facility/cutoff approach to licensing in 28 GHz band in the areas in which there is no incumbent FS licensee. Existing satellite earth stations and pending applications should be treated as protected, provided that any new facilities are timely constructed and brought into operation.

Incumbent LMDS operators that have met performance requirements have a reasonable expectation that they can maintain their primary FS rights in those geographic areas for their remaining license terms. A cutoff/facility licensing approach would have to respect the primary status of FS operations in those areas. However, those licensees do not have rights to, or an equitable expectation of receiving, an upgrade to primary mobile rights. The FCC can therefore create incentives for the incumbent to transition into a cutoff/facility licensing regime. For example, the incumbent LMDS operator might be offered an option to accept an exclusive five-year mobile license throughout the LMDS service area. At the end of the term the geographic license would expire, but all fixed and mobile facilities constructed and in use at the end of the five year term would receive facility licenses and be protected for as long as they remain in use. FS licensees rejecting the upgrade would retain primary status for FS but might then be subject to "overlay" mobile and FSS licenses.

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<sup>41</sup> See, e.g., NPRM ¶ 220.

An efficient cutoff/site license approach would require standard operating and protection parameters – technical and regulatory guidelines – for each permitted service deployment. These parameters, incorporated into the FCC’s rules, would allow operators and prospective licensees to undertake long range planning with a level of predictability. There is great uncertainty with respect to what the new parameters and characteristics for mmW terrestrial mobile services could or will encompass. While O3b understands the need for flexibility, without sufficiently defining the scope or scale of any new system introduced to a stable environment (such as today’s Ka band FSS systems), no one can predict what new equilibrium would result from the introduction of this new system. By some accounts, 5G may include smart homes, smart grids, car-to-car communication, security and surveillance, smart health services and other services connected to the network. These will each have different operating parameters and demands. Those will need to be defined at some level in order to determine transmitting earth station interference into receiving terrestrial mobile stations and transmitting terrestrial mobile stations aggregate interference into receiving satellites.

Considering the interference from transmitting earth stations into receiving terrestrial mobile stations, O3b believes the main parameters are contained within three groups: (1) earth station transmitter characteristics; (2) terrestrial mobile station receiver characteristics; and (3) the local terrain properties. Of these parameters, (2) contains the most unknowns. O3b has performed preliminary analysis using the 47  $\mu\text{V/m}$  field strength limit at market borders value<sup>42</sup> as a starting point. The results, calculated in terms of separation distance, vary between tens of meters to tens of kilometers, depending on the off-axis EIRP towards the terrestrial mobile station and the local terrain properties, both of which are unique to each earth station location.

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<sup>42</sup> See NPRM ¶ 289.

The relevant question is whether or not the 47  $\mu\text{V}/\text{m}$  value would protect all types of terrestrial mobile stations from FSS earth stations.

For determining the aggregate interference from transmitting terrestrial mobile stations into a receiving satellite, it must be determined how much EIRP density can be expected from terrestrial mobile devices towards a receiving satellite, and how many terrestrial mobile devices are expected to operate co-frequency and simultaneously within the receive beam footprint of an O3b satellite.<sup>43</sup> The NPRM notes that development of 5G requirements are planned for completion by early 2017.<sup>44</sup> Knowledge of those parameters is critical to establishing a reasonable shared use licensing framework. Accordingly, O3b proposes that the Commission adopt a two-step approach that first resolves the basic question of the licensing framework that will be applied in the report and order to be released this year. That report and order should include a further notice of proposed rulemaking seeking comment on appropriate technical rules for mobile and other deployments.

**G. A Cutoff or Filing Window Approach is Consistent with Ubiquitous Opportunistic/Unprotected Use**

Some NOI commenters argued that new sharing technologies make possible some opportunistic use of the mmW bands by ubiquitously deployed earth stations, even if the FCC authorizes primary mobile service in the 28 GHz band. While emphasizing the critical importance of protected, site-licensed access to the 28 GHz band for its own earth stations, O3b agrees that operation of ubiquitously deployed FSS earth stations on a non-interference basis could be technically feasible in the foreseeable future and, with appropriate safeguards, should be permitted. The cutoff/site license approach proposed here is fully consistent with, and in fact

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<sup>43</sup> We note that aggregate interference from typical FS point to point links may be negligible, but that the impact of those links, aggregated with interference from new mobile base stations and devices, would need to be considered.

<sup>44</sup> See NPRM ¶ 1 n.1.

more conducive of, such kinds of opportunistic access. Operating rules for such access could be developed in the further notice of proposed rulemaking described above, or in a later proceeding.

## **H. Comments Should FCC Proceed with Geographic Licenses**

To the extent the FCC authorizes mobile services on a co-primary basis in 28 GHz band, O3b responds to certain questions raised in the NPRM.<sup>45</sup>

### **1. Co-Primary Access for FSS Earth Stations**

O3b agrees that there should be a means under which satellite earth stations can acquire a co-primary status. However, co-primary access for satellite earth stations should not be based on either auctions or the secondary market. In its proposal for a process by which satellite earth stations may be granted co-primary access by means of a waiver, the NPRM acknowledges that it is possible to coordinate satellite earth stations with existing terrestrial licensees.<sup>46</sup> If the FCC authorizes co-primary mobile services in the 28 GHz band the mobile licensee should be required to coordinate in good faith with proponents of FSS earth stations and precluded from demanding payments from the FSS applicant.<sup>47</sup> The FCC should impose good faith bargaining obligations, subject to a “shot clock”, and provide a mechanism for the FCC to resolve disputes quickly. Once an FSS earth station has been coordinated, it should have protected status.

### **2. Geographic Area, License Term and Performance Requirements**

As explained above, the practice of dividing mobile service licenses into large, exclusive geographic areas is not appropriate for exclusive primary mmW licensing of mobile rights. Counties, though, are preferable to economic areas. Concerns about difficulty of administering

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<sup>45</sup> O3b has not addressed every aspect of every proposal in the NPRM which is incompatible with FSS services/operations. O3b reserves the right to address specifics later if needed in this and other proceedings.

<sup>46</sup> See NPRM ¶ 33.

<sup>47</sup> Mobile operators should be required to make information about their facilities public, so that FSS operators can consider those facilities in their planning. FSS proponents should be permitted to propose mitigation, at the FSS operator’s cost, if necessary to protect existing mobile facilities.

smaller geographic areas must be kept in perspective: the FCC's first job is to ensure that the nation's spectrum resources are deployed in the public interest. The propagation characteristics of the mmW bands require different approaches to spectrum management, and both the FCC and those choosing to enter the proposed higher frequency bands will be obliged to develop means of administration that are appropriate to a very large number of small-area deployments.

If the FCC proceeds with licensing by counties, economic areas, or some other geographic unit, it should do so only to provide the initial licensees with the flexibility to deploy anywhere in the geographic area, consistent with operating rules, during the initial license term. A five year initial term may be appropriate. If that term is inadequate for the planning and construction of mobile facilities, it is too soon to grant primary mobile licenses. O3b agrees with NOI commenters who observed that traditional performance requirements are wholly inadequate to assure efficient use of exclusive, geographically-assigned spectrum rights in the mmW bands.<sup>48</sup> No amount of coverage of census block centroids or any other geographic measure should convey the license to exclude other users in perpetuity from areas the initial licensee does not use. At the end of the term, all facilities that have been constructed should revert to protected, site-licensed facilities (or facility clusters, where appropriate), and future licenses should be issued pursuant to a cutoff approach as described above in these comments. Consecutive license terms with recurring payments, discussed at ¶ 221 of the NPRM, will not provide an adequate disincentive to warehousing. They simply change the financial calculation underpinning warehousing: the initial bid is smaller and discounted less. The lower price of entry could actually encourage warehousing by reducing the amount of capital that must be deployed up front.

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<sup>48</sup> See NPRM ¶ 198. O3b likewise disagrees with commenters who assert that secondary market policies can obviate the need for performance requirements. *Id.*

### **3. Information About Terrestrial Facilities**

Discussing a possible Spectrum Access System (“SAS”) at ¶ 152 for opportunistic satellite use of the mmW bands, the NPRM proposes to require terrestrial licensees (at the satellite operators’ cost) to provide satellite operators with essential information that the satellite operators will need in order to avoid causing interference to terrestrial operations. O3b agrees that terrestrial licensees should be required to make this information available to support opportunistic, unprotected use.<sup>49</sup> And this information is essential to a cut-off/site licensed approach. Even if the FCC chooses to grant geographic rather than site-based licenses, information about deployed facilities is needed for full and efficient use of the band. Satellite operators already file complete technical information for earth stations. Terrestrial operators likewise should provide complete technical information regarding all actual deployments. Each licensee should bear its own cost in making this essential information available.

### **III. CONCLUSION**

Geographic area licensing is not well suited to terrestrial mobile service deployments in the mmW bands. Although rationales for such licensing may emerge in the future, issuing terrestrial mobile geographic area licenses in the 28 GHz band on a primary basis to FSS, when FSS operators are already making highly productive and efficient use of the band to help spur the domestic and global broadband economies, would undermine investment and innovation in the mmW bands. If the FCC authorizes mobile service in the 28 GHz band it should do so pursuant to site licenses that provide fair access for FSS operators. Site licensing is a well-understood

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<sup>49</sup> The NPRM suggests that many of the parameters that would be needed for avoidance of interference to mmW terrestrial deployments are provided on Form 601 and relevant exhibits. *See* NPRM ¶ 152. Additional technical parameters (e.g., receiver sensitivity, receiver protection margin) would need to be available to ensure adequate protection of any fixed or mobile terrestrial deployment in mmW bands. For evaluation of the full interference environment, the potential for interference into satellite receive antennas would also need to be assessed. Antenna patterns for mmW mobile terrestrial equipment would be needed to calculate the energy that will be seen at O3b satellites.

licensing framework that provides a stable regulatory environment, effectively precludes warehousing, and fosters innovation and investment.

Respectfully submitted,

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